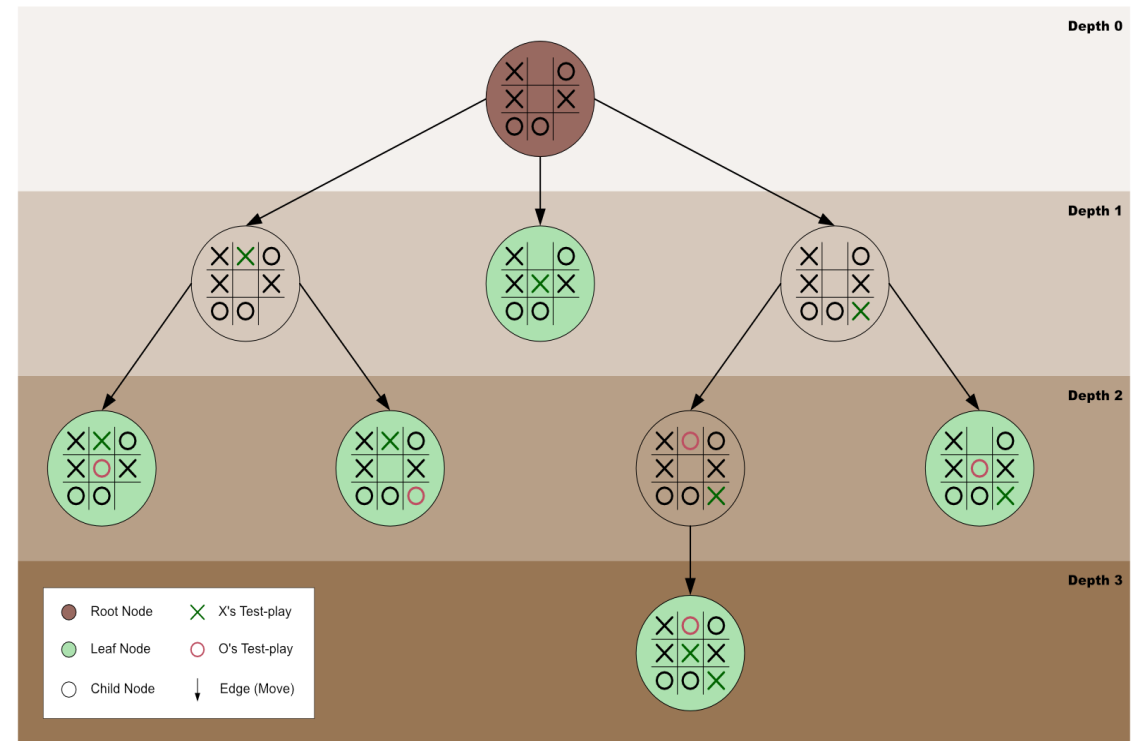
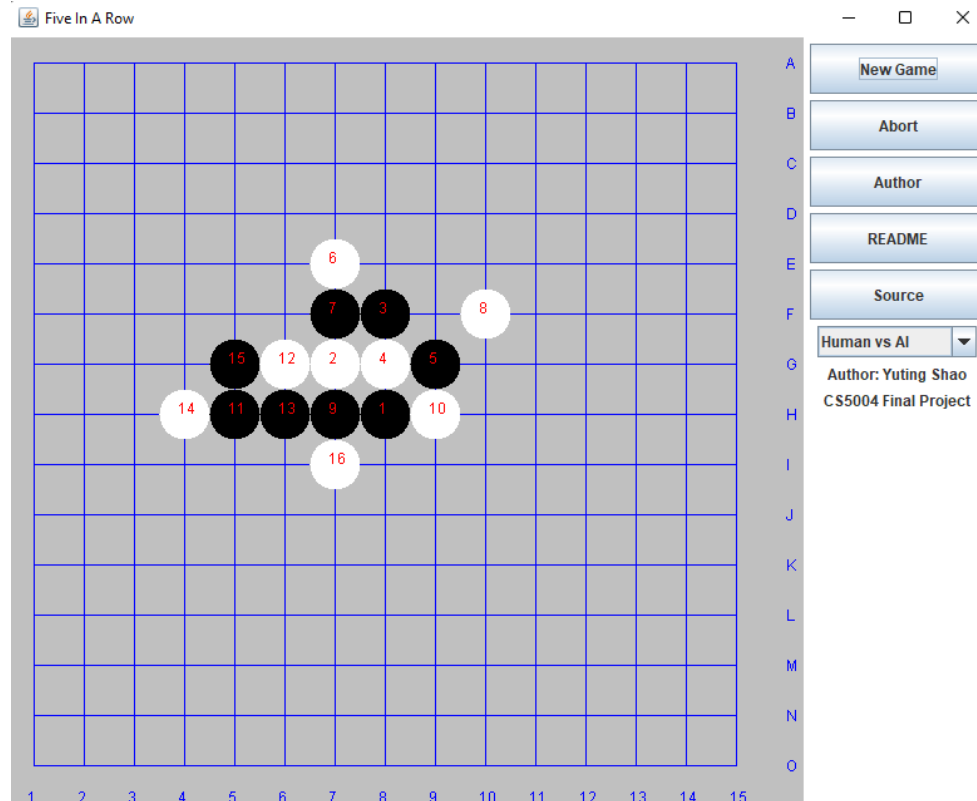


Implement the board game *Five In A Row* with AI player supported by the minimax algorithm with Alpha–beta pruning

Final project of CS5004

Yuting Shao

08/16/2022



Compared with previous project, now it is a better design pattern

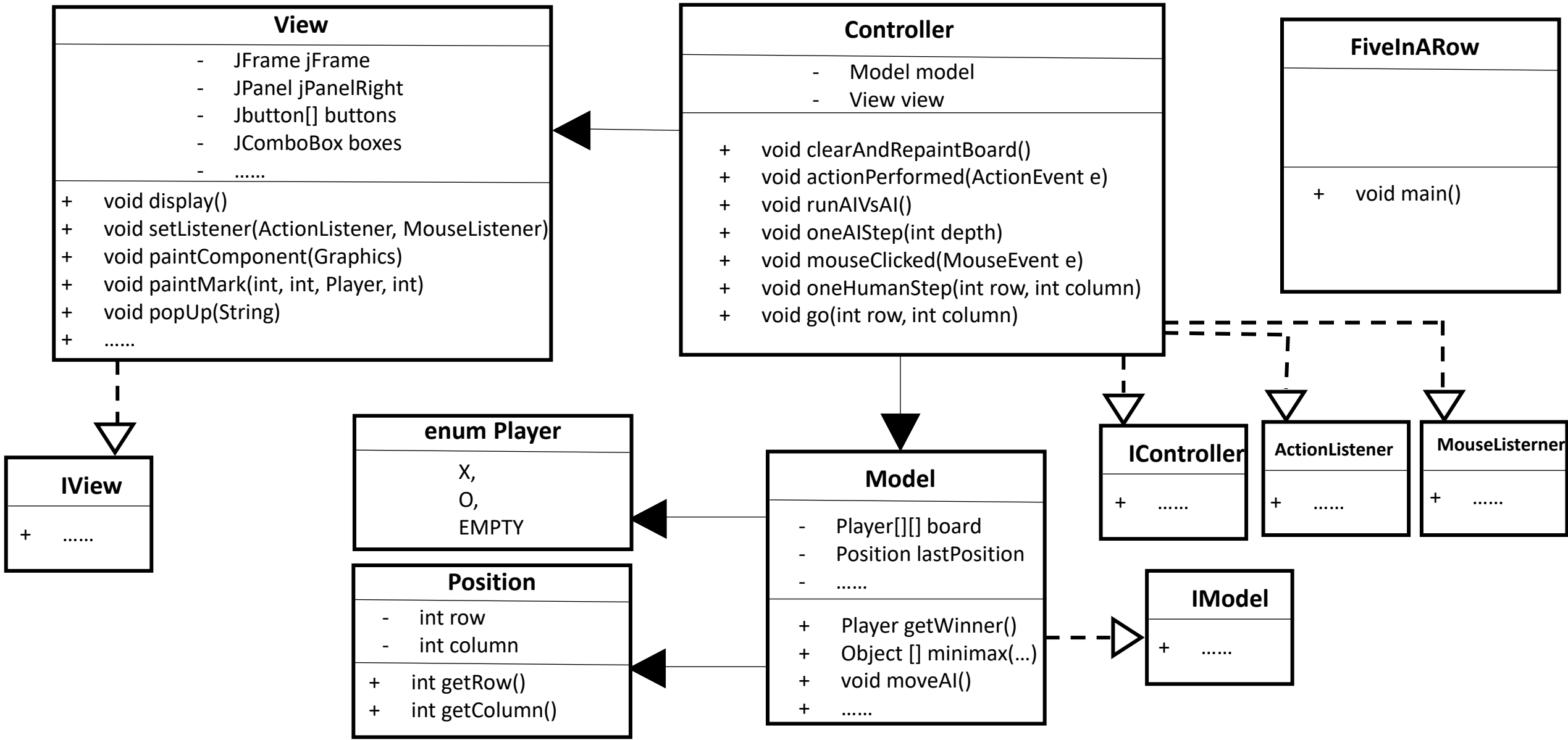
- **Model-View-Controller pattern (MVC):**

Model: Handles data, game and AI player algorithm

View: Provides the game board and option buttons to the user

Controller: Coordinates between model and view to let the game go

MVC design pattern and the UML diagram

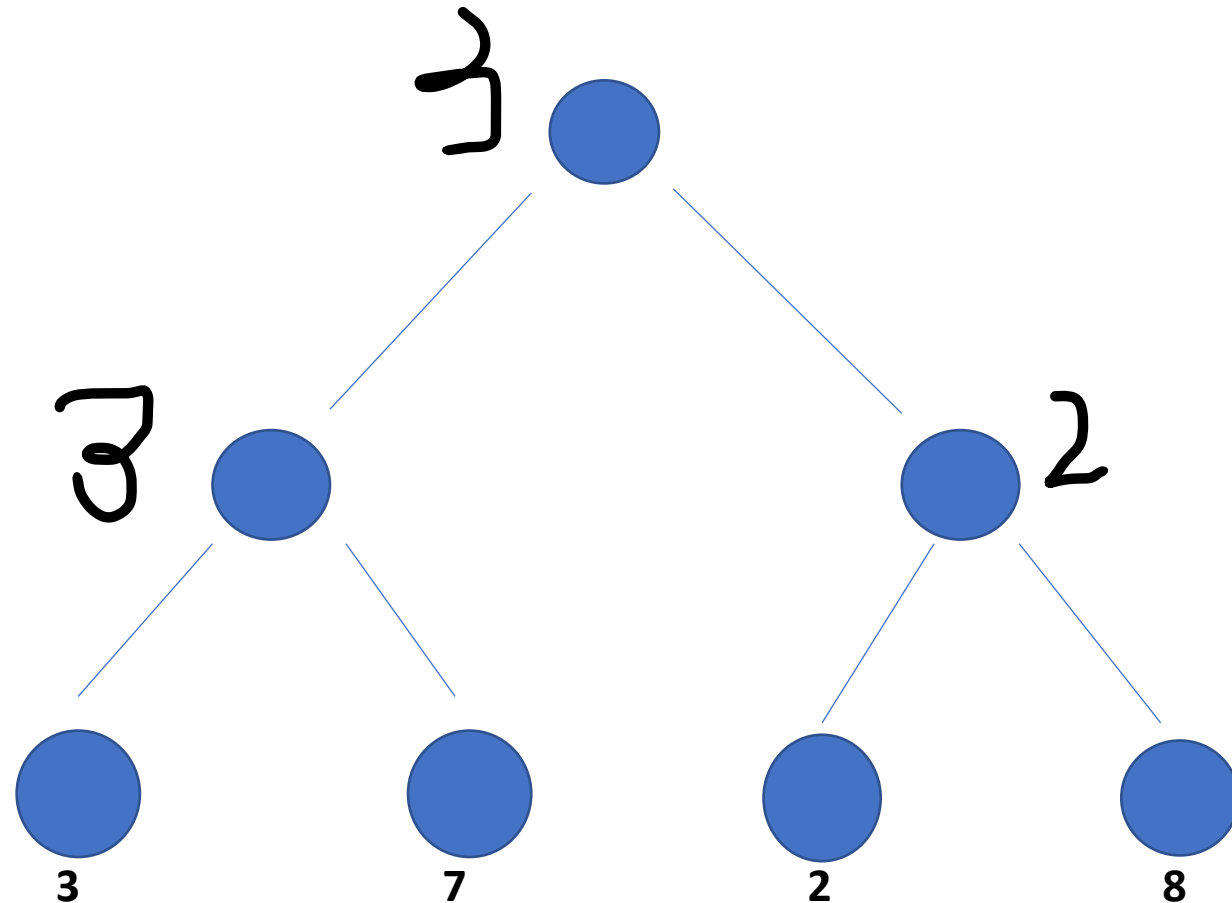


A smarter AI player using minimax algorithm

Minimax algorithm:

Max

Min

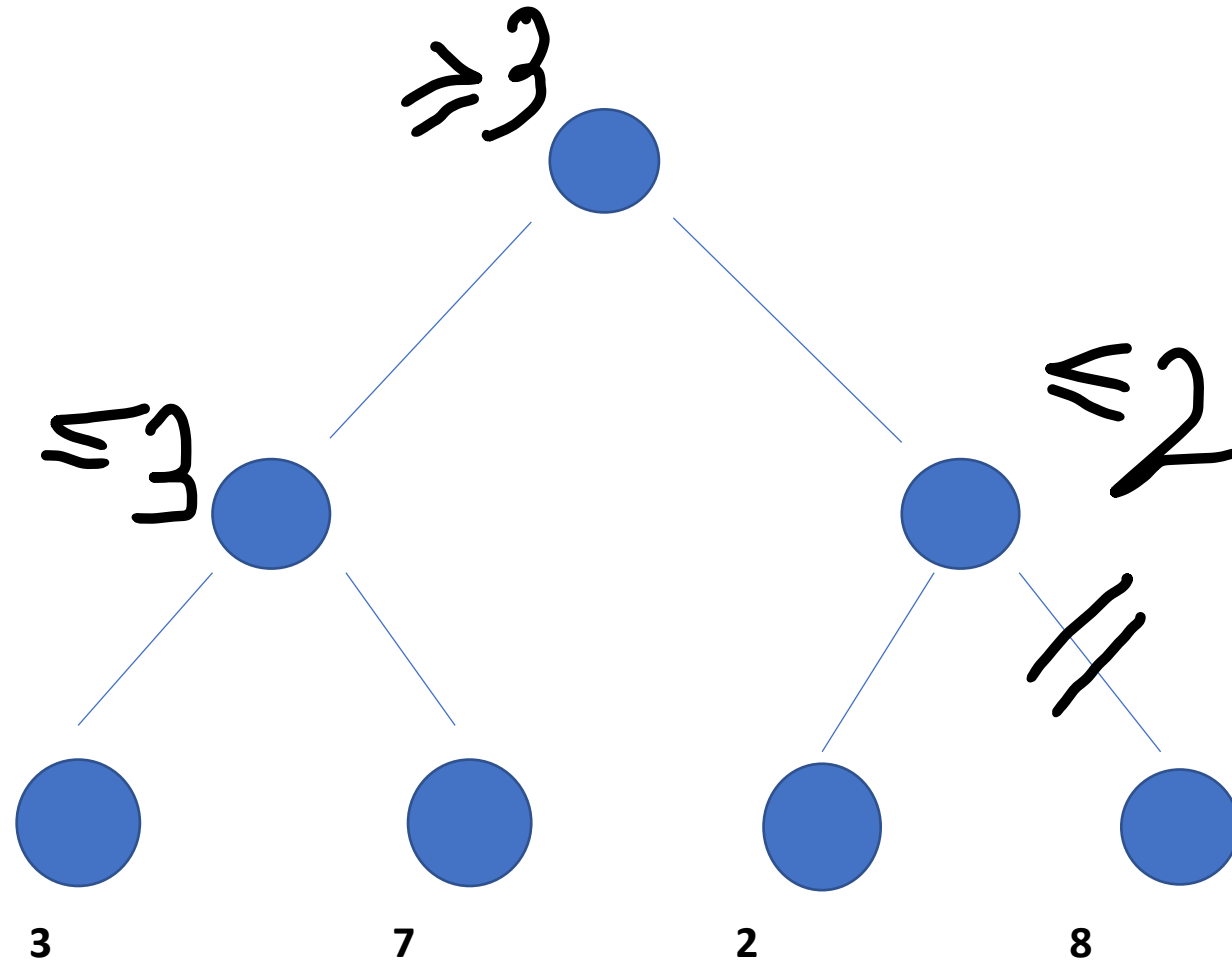


Using Alpha-beta pruning to increase the efficiency

Alpha-beta pruning:

Max

Min



Lessons learned

- Java Swing can be used to implement graphical user interface
- Model-View-Controller is a commonly used software architectural pattern to separate the responsibilities of the program
- Minimax algorithm is useful for the decision making in two players' game and the key part determining the quality of the decision is the evaluate method for different situations and the depth of the minimax game tree.
- Deeper minimax tree can get smarter decision but slow down the efficiency.

Future extensions

- Provide more options in the game: such as undo a move, get a suggested move from the AI for the human player.
- How to improve the efficiency of the minimax algorithm? Parallel computing might be helpful.